

given for spinel and corundum by Gaudin, Ebelmen, H. Sainte-Claire Deville, and Caron. More recently, MM. Frémy and Feil have prepared the ruby in large crystalline masses unsuitable for cutting, although possessing all the properties of the natural mineral.

Fresh essays seem to have led to more practical results, as for some time past rubies of fair dimensions are met with in the trade, which, although rather less brilliant and transparent, possess the hardness, density, and optical properties of this valuable gem. Several features of their inner structure show conclusively that they were obtained by fusion; in any case it is well known that, unlike silica, which remains vitreous, alumina crystallises by fusion.

The diamond alone appears to have hitherto resisted all attempts at reproduction. Although success in this direction has been frequently announced, the statement has always proved erroneous. The problem is rendered more difficult from the fact that the diamond has nowhere been found in its original lode. This holds good as well for the Brazilian itacolumites and quartzites, and for the serpentine breccias of South Africa, as for the diamantiferous sands. Nevertheless, in the diamond are occasionally embedded some foreign substances, which, while depreciating its commercial value, are very interesting as showing that it must have been formed at a relatively low temperature.

But enough has been said, M. Friedel concluded, to enlist your interest in mineralogy, a science whose progress has been rapid, whose methods are being constantly renewed, and which in every respect deserves the attention of inquiring minds.

SCIENTIFIC SERIALS

American Journal of Science, August.—On hitherto unrecognised wave-lengths, by S. P. Langley. The object of the laborious and delicate operations here fully described has been, not so much to settle the theoretical questions involved in determining the relation between dispersion and wave-length, as to enable future observers to determine the visible or invisible wave-lengths of any heat, whether from a celestial or terrestrial source, observed in any prism. A knowledge will thus be gained of the intimate constitution of radiant bodies, which an acquaintance with the vibratory period of their molecules can usually alone afford. These researches into the whole unexplored region of infra-red energy both from celestial and terrestrial sources have led to the certain determination of wave-lengths greater than 0.005 mm. Radiations have also been recognised whose wave-length exceeds 0.03 mm., so that, while the wave-length known to Newton has been directly measured to nearly eight times, there is probable indication of wave-lengths far greater. The gulf between the shortest vibration of sound and the longest known vibration of the ether has thus in some measure been already bridged over.—On the chemical composition of herderite and beryl, with note on the precipitation of aluminium and separation of beryllium and aluminium, by S. L. Penfield and D. N. Harper. The composition of herderite is shown to be an isomorphous mixture of CaBeFPO_4 with CaBe(OH)PO_4 , which may be written CaBe(FOH)PO_4 , or a salt of phosphoric acid, two of whose hydrogen atoms have been replaced by a bivalent element, and the third also by a bivalent element whose other free affinity has been satisfied by a fluorine atom or hydroxyl. Chemically it is closely related to wagnerite, triplite, and triploidite, these minerals offering the best illustration of the isomorphism of F and OH. In crystallisation, herderite is orthorhombic, with a prismatic angle of nearly 120° . Regarding water as an essential constituent of beryl, the authors add $\frac{1}{2}\text{H}_2\text{O}$ to its usually accepted formula, writing it $\text{H}_3\text{Be}_2\text{Al}_4\text{Si}_2\text{O}_{37}$. Its theoretical composition, according to this formula, becomes SiO_2 65.81; Al_2O_3 18.83; BeO 13.71; H_2O 1.65. Specific gravity, 2.706.—Communications from the U.S. Geological Survey, Division of the Rocky Mountains, by Whitman Cross and L. G. Eakins. The present paper deals with pitilolite, a new mineral occurring in cavities of a more or less vesicular augite-andesite, which is found in fragments in the Tertiary conglomerate beds of Green and Table Mountains, Jefferson County, Colorado. It is described as a white substance in extremely delicate tufts and spongy masses composed of short hair-like needles loosely grouped together; hence its proposed name of pitilolite, from the Greek $\pi\tau\iota\lambda\omicron\nu$ = down, in reference to the light downy nature of its aggregates. Its empirical formula is $\text{RO}, \text{Al}_2\text{O}_3, 10\text{SiO}_2 + 5\text{H}_2\text{O}$, R representing Ca, K_2 , and Na_2 ; it

is thus an aluminosilicate of which no previously described hydrate contains so high a percentage of silica. In this respect it may compare with the rare mineral milarite.—Notes on the peridotite of Elliot County, Kentucky, by J. S. Diller. This formation, described as a dark greenish rock with specific gravity 2.781, appears to be undoubtedly of eruptive origin, traversing many thousand feet of palaeozoic strata to reach the surface. Its mineralogical composition shows 40 per cent. of olivine, 30.7 serpentine, 14 dolomite, 8 pyrope, 2.2 ilmenite, 2 magnetite, with smaller quantities of biotite, enstatite, octahedrite, and apatite.—Temperature observations at the Lake Superior Copper-Mines, by H. A. Wheeler. The unusually low thermal gradients recorded in these mines—about 1°F . to 100 feet as compared with the normal of 1°F . to 50 or 55 feet in vertical descent, is attributed to the proximity of the cold waters of Lake Superior. The nearer the mines are to this great cooling influence, the lower the thermal gradient will be found to be.—An application of the copper reduction test to the quantitative determination of arsenic, by Henry Carmichael. Using a standard square of copper as an indicator, the author has been led to adopt the method here described, which, for the estimation of small quantities of arsenic in the human system or elsewhere, he believes to be quicker, simpler, more delicate, and, in the hands of toxicologists, less exposed to fallacy, than any other. A copper square 1 millimetre on a side detects 0.000025 grm. arsenious oxide, a quantity 400 times less than that necessary for turning the beam of the ordinary chemical balance.—On the crystallisation of gold, by Edward S. Dana. The paper deals more especially with the delicate crystalline threads and arborescent forms from the White Bull Mine, Oregon, and the specimens of finely crystallised gold from the Californian mines. The crystals are illustrated and fully described.—Classification of the Cambrian system of North America, by Charles D. Walcott. The formations here treated are those characterised by the predominance of the types of Barrande's "First Fauna," and such additional strata, not characterised by the presence of fossils, as are stratigraphically and structurally connected with the Cambrian strata identified by organic remains. These formations, showing a total thickness of over 18,000 feet, with a known fauna of 92 genera and 393 species, are regarded, not as a subdivision of the Silurian, but rather as a well-defined geological system underlying the Lower Silurian (Ordovician) on the North American continent.—Note on the spectrum of Comet ϵ , 1886, by O. T. Sherman. When observed with the equatorial of Yale Observatory in May and June, this comet presented no less than seven loci of light where three only are usually seen. These showed approximate wave-lengths 618.4, 600.6, 567.6, 553.7, 517.1, 468.3, and 433.2, besides strongly suspected loci at 545.4, 535.0, 412.9, and 378.6. These are compared with the low temperature spectrum of carbohydrogen, and it is suggested that a chart should be prepared for the carbon compounds at successive heat-levels, after the manner of that drawn up by Lockyer for the photographed spectra of some carbon compounds (*Proc. Roy. Soc.*, xxx. p. 463).

Annalen der Physik und Chemie, Bd. xxviii., No. 7, July 1886.—Th. Schröder, experimental investigation of the influence of temperature upon elastic reaction. The experiments were made with three wires, respectively of silver, iron, and german silver. The elastic reaction was greatest with the first, least with the last of these, and the change in the elastic reaction produced by change of temperature followed the same order.—E. Warburg, remarks on the pressure of saturated vapour. Discusses relation between vapour-pressure and curvature of liquid surface.—W. Fischer, on the pressure of saturated vapours above liquid and above solid substances. The substances chosen were ice and water. The difference, for ice, between the two differential coefficients of pressure with respect to temperature for saturated steam over ice and saturated steam over water is 0.0465, at the melting-point, where the two curves meet. For benzol the two curves do not meet at its melting-point.—A. Schrauf, on dispersion and axial density in prismatic crystals; and on the properties of trimetric crystals. The latter shows the existence of a relation between coefficients of expansion, axial density, and the parameters of the crystal.—A. Toepler, some lecture experiments on waves. A small gas flame is used to show the propagation of a wave of compression in a long tube filled with air, and provided at one end with an india-rubber pear. Several interesting experiments can be shown.—E. Cohn

and L. Arons, conductivity and dielectric constants. An investigation as to whether the dielectric constant of a conductor is infinite, as often stated in text-books. A condenser was arranged to be filled with mixtures of anilin and benzol, xylol, mixtures of anilin and xylol in various proportions, &c., liquids being selected to avoid as far as possible residual charges. The capacities of this condenser were compared with that of an air-condenser, and arrangements were also made to measure the resistances on the bridge. The resistances of the three mixtures of anilin and xylol were 224,900, 1,383,000, and 18,780,000 Siemens's units, and their dielectric constants 1.590, 1.443, and 1.336. The authors conclude from these and other experiments that there is no necessary relation between the two constants; and, further, that the wide differences observed by Hopkinson between the square root of the dielectric constant and the index of refraction in certain vegetable oils cannot be explained by the conductivity.—E. Hoppe, on the theory of unipolar induction: experimental verification of Edlund's theory of the origin in terrestrial magnetism of auroral phenomena.—H. Jahn, on the equivalence of chemical energy and current energy. A discussion of Helmholtz's theory of the secondary heat of a voltaic element.—H. Jahn, on galvanic polarisation. A study of changes of polarisation of certain liquids with changes of temperature, together with deductions verifying Helmholtz's equations.—G. Adler, on the energy of magnetically polarised bodies.—E. Ketteler, addendum on the total reflection of crystals.—F. Koláček, on the gold-leaf spectroscopy. An attempt to calculate a calibration of the electroscope from its electrostatic capacity.

THE number of the *Nuovo Giornale Botanico Italiano* for April 1886 contains a number of short articles on various points relating to the flora of different parts of Italy, both phanerogamic and cryptogamic.—Sig. A. Mori describes and figures a singular instance of the production of a pitcher-like structure on the upper surface of a leaf of *Gunnera scabra*.—Dr. O. Mattirollo has examined the "mycorrhiza" of the roots of the sweet chestnut, and finds it to furnish a new example of polymorphism among the Hypocreaceæ. It consists largely of two species of fungus, which he names *Melanospora styranophora* and *M. Gibelliana*. The former is identical with *Stysanus Steninitis* and also with an *Acladium*, and presents an instance of "apandry," or the production of ascospores independently of the previous formation of a male organ. *M. Gibelliana* produces chlamydospores, and also the peculiar structures known as "spore-bulbils," which appear to replace the true ascophorous perithecia.

The most interesting article in the number for July is by Sig. A. Piccone, on the plants growing wild in Liguria which he terms "zoophilous" or "ornithophilous," i.e. those which are absolutely dependent for the germination of their seeds on the fruit being swallowed by birds.

SOCIETIES AND ACADEMIES

LONDON

Entomological Society, August 4.—Prof. J. O. Westwood, M.A., F.L.S., in the chair.—The following gentlemen were elected Fellows:—Lord Dormer, Messrs. J. H. A. Jenner, James Edwards, Morris Young, F. V. Theobald, E. A. Atmore, and William Saunders, President of the Entomological Society of Ontario.—Mr. Theodore Wood exhibited and made remarks on the following Coleoptera: an abnormal specimen of *Apion pallipes*; a series of *Langelandia anophthalmi*, from St. Peter's, Kent, taken in decaying seed-potatoes; a series of *Adelops wollastoni*, and *Anommatus 12-striatus*, also from decaying seed-potatoes; and a series of *Barypeithes pellucidus*, from the sea-shore near Margate. Mr. Wood also exhibited, on behalf of Dr. Ellis, of Liverpool, a specimen of *Apion annulipes*.—Prof. Westwood exhibited five specimens of a species of *Culex*, supposed to be either *C. cantans* or *C. lateralis*, sent to him by Mr. Douglas, who had received them from the Kent Water-Works. It was stated that they were very numerous in July last, and that persons bitten by them had suffered from "terrible swellings." Prof. Westwood also exhibited some galls found inside an acorn at Cannes in January last.—Mr. Billups exhibited a male and female of *Cleptes nitidula*, taken in copula in July last, at Benfleet, Essex, on the flowers of *Heracleum sphondylium*. He stated that it was probably the

rarest of the twenty-two known species of British *Chrysidide*, though it had been recorded from the New Forest and from Suffolk.—The Rev. W. W. Fowler announced that a series of specimens of *Homalium rugulipenne* had been received from Dr. Ellis, of Liverpool, for distribution amongst Members of the Society.—Mr. White exhibited a group of three specimens of *Lucanus cervus*, consisting of a female and two males. The female was in copula with one of the males, which, while so engaged, was attacked by the second male.—Mr. E. A. Fitch read a paper, communicated by Mr. G. Bowdler Buckton, on the occurrence in Britain of some undescribed *Aphides*.—Prof. Westwood read a paper on a tube-making homopterous insect from Ceylon.—Mr. Theodore Wood read a paper on *Bruchus*-infested beans. A discussion ensued, in which Prof. Westwood, the Rev. W. W. Fowler, and Messrs. Weir, Fitch, and Trimen took part.

PARIS

Academy of Sciences, August 16.—M. Fizeau in the chair.—The Secretary announced the loss sustained by the Academy in the death of M. Laguerre, Member of the Section for Geometry, who died on August 13 at Bar-le-Duc. At the obsequies, which took place on August 16, the Academy was represented by M. Halphen.—Remarks on the recent volcanic disturbances in the Northern Island, New Zealand, by M. Emile Blanchard. The author pointed out that this sudden display of igneous activity was a remarkable confirmation of the views already advocated by him in 1882 and 1884 on the subsidence of an austral continent during the modern geological age of the earth. He regarded the New Zealand Archipelago and more or less adjacent islands as a remnant of this continent, or at least of an extensive region, which had existed in a comparatively recent epoch, and he had already, in 1884, anticipated fresh convulsions, such as the tremendous catastrophe of which New Zealand had been the scene after a lengthened period of quiescence. Tarawera and other volcanoes supposed to be extinct have suddenly broken out into fresh activity; lava-streams have overspread vast spaces, and a romantic tract of country, the delight of the early explorers, has been wasted or swallowed up. Although the exact change that has taken place in the aspect of the land cannot be fully known for some time to come, the event already appears as an illustration of still more violent outbursts, which occurred in more or less remote ages. Thus it has been shown in this instance that the inductions drawn from a recently-created science already bear the character of certainty.—On the differential equation of a curve of any order, by Prof. Sylvester. It is shown that a direct and universal solution may be had of the following problem: To find the differential equation of a curve of the order n , where the function of the equation (with unity for constant term), whether U or $(x, y, 1)^n$ is represented under the symbolic form u^n , where $u = a + bx + y$. It is added that the formulas given by M. Halphen in his "Recherches des points d'une courbe algébrique plane," &c., lead to the same results as those here arrived at.—On the employment of intermittent light for the measurement of rapid movements, by M. Gustave Hermite. Indicators of velocity at present in use always absorb a portion of the force of the machine to which they are applied. The author proposes to avoid this inconvenience by the arrangement here described, which, by an ingenious application of intermittent light, enables the observer to measure not only the number of revolutions of any machine, but the velocity of any rapid movement whatsoever, without exercising any mechanical action on the apparatus under examination.—On the mono-substituted haloid derivatives of acetonitril, by M. Louis Henry. The researches undertaken by the author on the functional solidarity and the volatility of the carbon compounds have led him to complete the series of these derivatives. Here he describes mono-ioduretted acetonitril, $\text{ICH}_2\text{—CN}$, and monobromuretted acetonitril, $\text{BrCH}_2\text{—CN}$, reserving for a future communication the comparative study of the mono-substituted haloid derivatives of acetonitril and acetate of methyl.—On the composition of the mineral waters of Bagnères-de-Luchon, Haute-Garonne, by M. Ed. Willm. It is shown that carbonic acid, far from being a negligible quantity in these and similar waters, as was supposed by the late M. Filhol, mostly occurs in a proportion more than sufficient to give a quantity of bicarbonates corresponding to the alkaline property of the water, independently of that which is due to the sulphuret. A complete analysis yielded sulphuric and carbonic acid, chlorine,